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Certified by

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EL738969819US

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☐ Additional inventors are being named on the ____ separately numbered sheets attached hereto

TITLE OF THE INVENTION (500 characters max)

FRAME INTEGRATED REAR SUSPENSION

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages* 7
☒ Drawing(s) *Number of Sheets* 3
☐ Application Data Sheet. See 37 CFR 1.76
☐ CD(s), Number
☒ Other (specify) Cert. of Exp. Mail; return postcard

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☐ Applicant claims small entity status. See 37 CFR 1.27.
☐ A check or money order is enclosed to cover the filing fees
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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

SIGNATURE _____ Date 07/28/2003

TYPED or PRINTED NAME Kevin S. MacKenzie REGISTRATION NO. 45,639 *(if appropriate)*

TELEPHONE (313) 965-8331 Docket Number: 20912-093277

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Attorney Docket No. 20912-093277

FRAME INTEGRATED REAR SUSPENSION

Field of the Invention

[0001] The present invention relates generally to wheel suspension systems for motor vehicles and, more particularly, to a rear wheel independent suspension system. acknowledgement

Description of the Related Art

[0002] Suspension systems of a vehicle connect the axle shafts with the vehicle body. The suspension system controls a position of a tire with respect to the vehicle body while maintaining its position during the movement of the vehicle. Generally, a suspension system prevents the axle shaft from directly transmitting vibrations or impacts from a road surface to the vehicle body; thereby, providing a smoother ride. Typically, suspension systems are made to be flexible to absorb the impact from a road surface and limit the forces transmitted between the tires and the vehicle body.

[0003] Suspension systems are generally classified according to their performance characteristics and structures. For example, many vehicles are manufactured with independent rear suspensions wherein each wheel is able to react to the conditions of driving without transmitting its motion and forces to the vehicle body or other wheel. This independent suspension improves the handling and driving characteristics of the vehicle.

[0004] Typically, independent suspensions are designed such that they exhibit dynamic handling responses during understeering conditions. A preferred suspension design would exhibit minor changes of wheel position during driving under a straight condition, as well as exhibit a high transverse reaction force during cornering. Such suspension characteristics are typically achieved by a suspension having a high roll center, as well as, the ability to provide for changes in camber angle to compensate for body roll during a cornering maneuver. Further, lateral forces produced during a cornering maneuver should typically generate a toe-in behavior equaling the body roll understeering during the cornering maneuver.

[0005] As well as the performance characteristics outlined above, it is desirable to have a suspension system having a reduced number of parts thereby lowering the overall cost of a suspension system for a motor vehicle. There is, therefore, a need in the art for a suspension system exhibiting a significant toe-in through lateral forces, as well as a high roll center and a reduced number of parts compared to typical suspension systems; thereby, lowering the overall cost of a suspension system.

Summary Of The Invention

[0006] A rear suspension system for a vehicle that includes a pair of spaced frame rails. A pair of trailing arms are attached to each of the spaced frame rails at a first end of the trailing arm and to a wheel carrier at a second end of the trailing arm. A transmission cross member is positioned and coupled between the spaced frame rails. A pair of upper control arms are attached to each of the trailing arms at a first end of the control arm and to the transmission cross member at the second end of the control arm. A compound link member is attached to the pair of trailing arms at opposing ends of the compound link member. The compound link member includes a bell crank associated with the link member. A watts linkage including opposing connecting rods attached to the frame rail at one end of the connecting rods and to the bell crank associated with the compound link member at the other end of the connecting rods.

Brief Description Of The Drawings

[0007] Additional features and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

[0008] Figure 1 is a top, front perspective view of the suspension system of the present invention;

[0009] Figure 2 is a rear, bottom perspective view of the suspension system of the present invention;

[0010] Figure 3 is a perspective view detailing the suspension system without the wheels and frame rail;

[0011] Figure 4 is a partial top view detailing the attachment of the trailing arm, upper control arm and compound link with the frame rail.

Detailed Description Of The Preferred Embodiments

[0012] Referring to Figure 1, a rear wheel suspension system 5 including a pair of spaced frame rails 10, a pair of trailing arms 15, and a transmission cross member 20 is shown. A pair of upper control arms 25 are connected at one end 26 to the transmission cross member 20 and at a second end 27 to the trailing arms 15. A compound link member 30 is attached to the pair of trailing arms 15 at opposing ends 31, 32 of the compound link member 30. The compound link member 30 includes a bell crank 35 associated therewith. A watts linkage 40 including opposing connecting rods 41, 42 attached at one end 43 to the frame rail 10and at the other ends 44 to the bell crank 35 is also included.

[0013] As seen in Figure 2, the pair of spaced frame rails 10 are connected to each other by various cross members distributed along a length of the frame rails 10 Specifically, the transmission cross member 20 provides support to the transmission casing 21, as well as provides structural rigidity to a chassis of a vehicle formed by the frame rails 10. The transmission cross member 20 is preferably coupled to the frame rails 10 using brackets 22 attached to the frame rails 10, as best seen in Figure 1.

[0014] A pair of trailing arms 15 comprising inner 16 and outer 17 components are attached to one of the spaced frame rails 10 at a first end 18 of the trailing arm 15 to a wheel carrier 45 at a second end 19 of the trailing arm 15. As best seen in Figures 1 and 2, the inner and outer components 16, 17 of the trailing arm 15 are attached to an outer portion 8 of the frame rail 10 by an appropriate bracket 9 attached to the frame rail 10.

[0015] As best seen in Figures 2 and 3, half shafts 50 from the transmission 21 are coupled to the wheel carriers 45 through an opening formed in the trailing arms

15. The half shafts 50 provide rotational motion to the wheel carriers 45 from a shaft (not shown) engaging the rear transmission 21.

[0016] Referring to Figure 3, a pair of upper control arms 25 are attached to the trailing arms 15 at a first end 26 of the control arm 25, and to the transmission cross member 20 (as best seen in Figure 1) at the second end 27 of the upper control arm 25. The upper control arms 25 provide structural strength to the suspension system 5, as well as provide control and relieve stresses associated with the trailing arm 15 attached to the wheel carrier 45.

[0017] Again, referring to Figure 3, the compound link member 30 is positioned between the opposing trailing arms 15 and is attached at a lower portion 55 of the trailing arm 25 by an appropriate bracket 60. The compound link member 30 includes a bell crank 35 associated therewith approximately at the center of the compound link member 30 between the pair of trailing arms 15. A watts linkage 40 comprising opposing connecting rods 41, 42 are attached at one end 43 to the frame rails 10 and at the other end 44 to the bell crank 35 with the use of appropriate bushings. As best seen in Figure 2, the connecting rods 41, 42 are connected on their first end 43 to the frame rail 10 by an appropriate bracket 70 attached to the frame rail 10. The bell crank portion 35 of the watts linkage 40 provides crosswise or lateral support for the suspension as the connecting rods 41, 42 or links are positioned in a transverse direction with reference to the driving direction. The watts linkage 40 transmits the lateral forces necessary to achieve the desirable toe-in and lateral force transfer characteristics outlined in the background section of the application.

[0018] In a preferred aspect of the present invention, the suspension system 5 further includes a pair of coil over shocks 75 as best seen in Figures 2 and 3, attached to the compound link member 30 via appropriate brackets 80. The coil over shocks 75 are attached at their other end to the spaced frame rails 10 to provide for motion of the trailing arms 15 and compound link member 30 relative to the frame rails 10.

[0019] The invention has been described in an illustrative manner. It is to be understood that the terminology, which has been used, is intended to be in the nature of words of description rather than of limitation. Many modifications and variations of the invention are possible in light of the above teachings. Therefore, within the

scope of the appended claims, the invention may be practiced other than as specifically described.

CLAIMS

What is claimed:

1. A rear suspension for a vehicle comprising:

a pair of spaced frame rails;

a pair of trailing arms, each of the trailing arms attached to one of the pair of spaced frame rails at a first end of the trailing arm, and to a wheel carrier at a second end of the trailing arm;

a transmission cross member coupled between the spaced frame rails;

a pair of upper control arms, each of the upper control arms attached to one of the trailing arms at a first end of the upper control arm and to the transmission cross member at a second end of the upper control arm;

a compound link member attached to the pair of trailing arms at opposing ends of the compound link member, the compound link member including a bell crank associated therewith;

a watts linkage comprising opposing connecting rods attached at one end to the frame rail and to the bell crank at the other end of the connecting rod.

2. The rear suspension of claim 1 further including a pair of coil over shocks attached to the compound link member.

ABSTRACT

A rear suspension system for a vehicle that includes a pair of spaced frame rails. A pair of trailing arms are attached to each of the spaced frame rails at a first end of the trailing arm and to a wheel carrier at a second end of the trailing arm. A transmission cross member is positioned and coupled between the spaced frame rails. A pair of upper control arms are attached to each of the trailing arms at a first end of the control arm and to the transmission cross member at the second end of the control arm. A compound link member is attached to the pair of trailing arms at opposing ends of the compound link member. The compound link member includes a bell crank. A watts linkage including opposing connecting rods attached to the frame rail at one end of the connecting rod and to the bell crank at the other end of the connecting rod is associated with the compound link member.

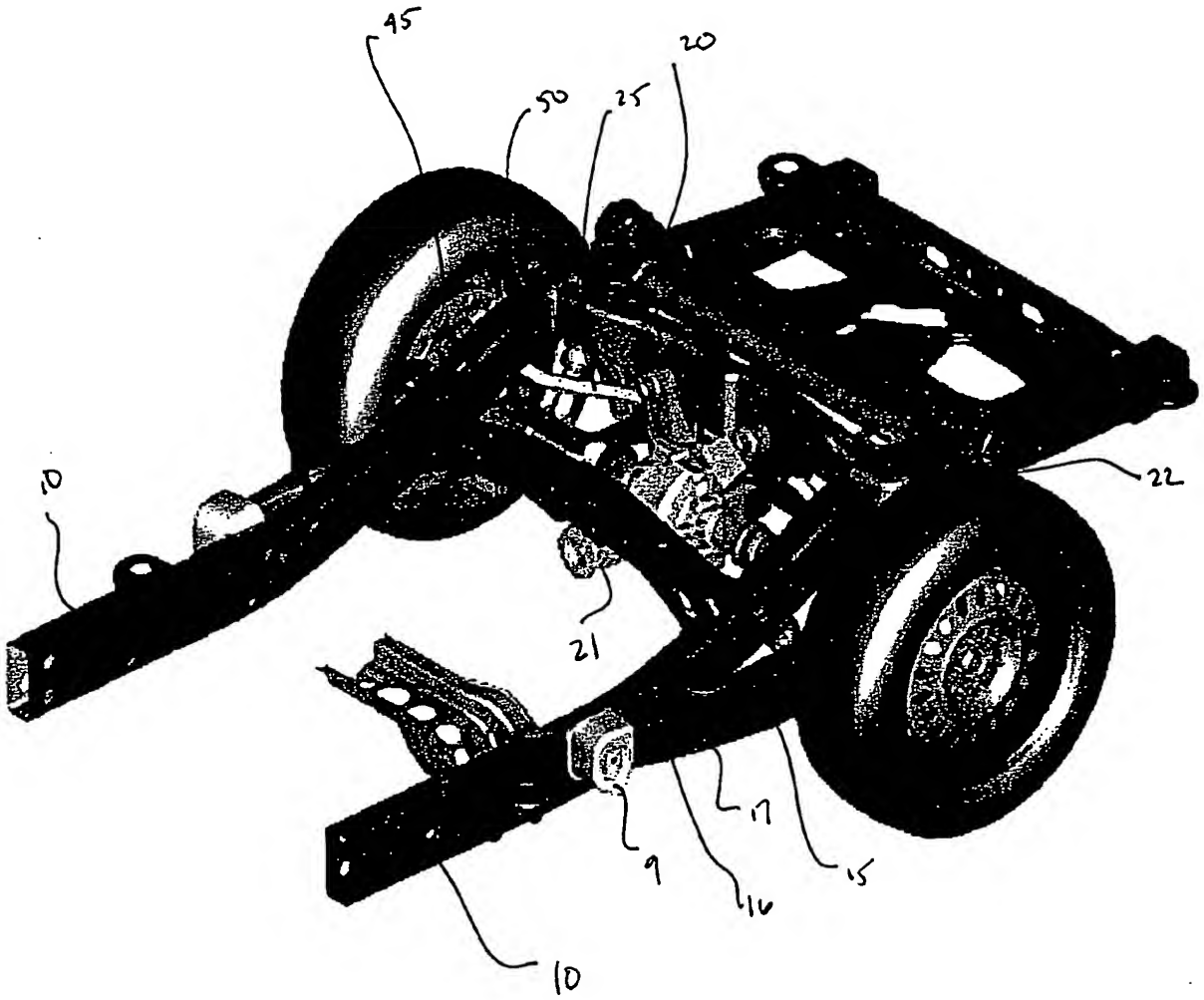

FIGURE 1

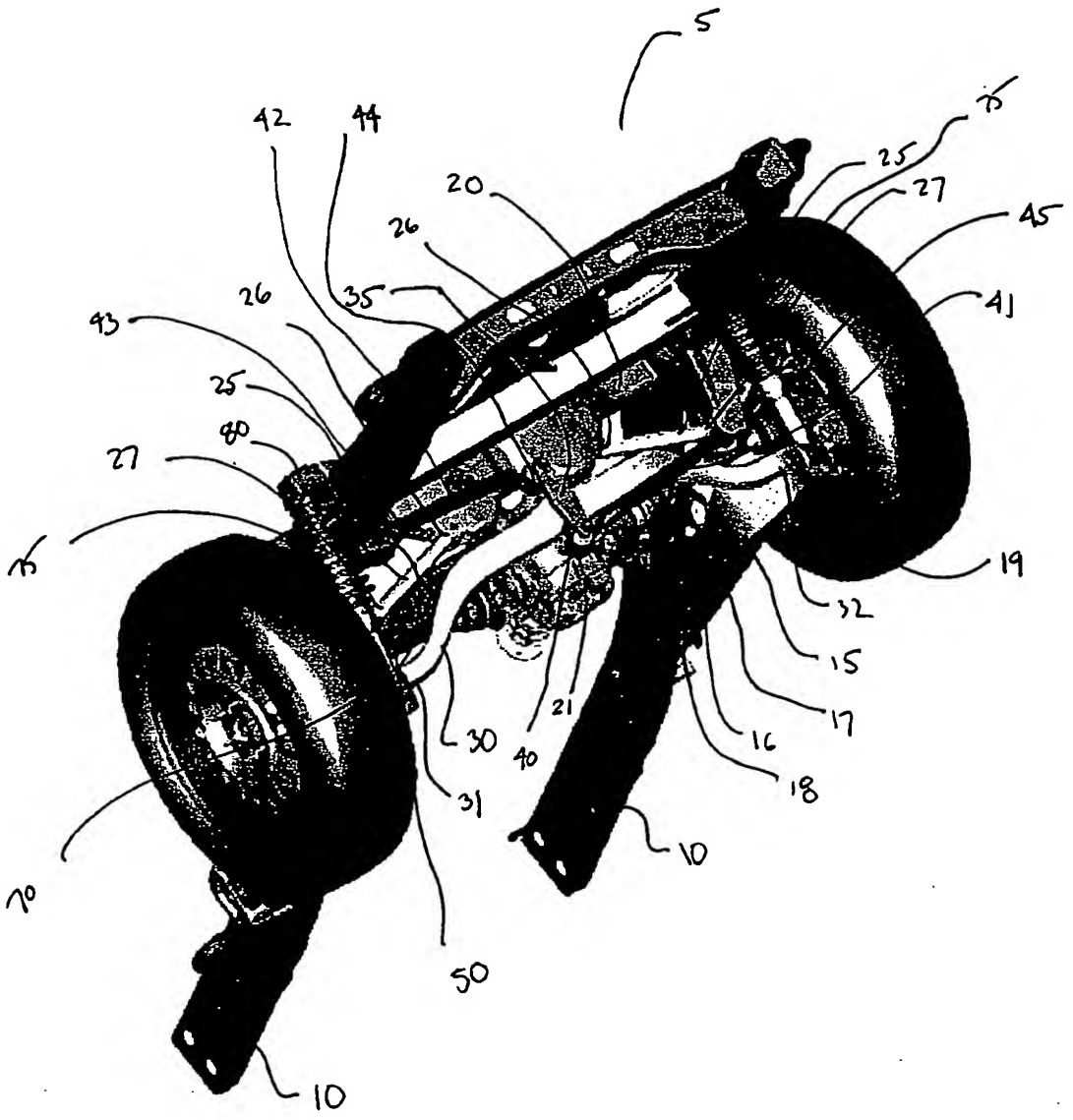
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FIGURE 2

MAGNA
COSMA INTERNATIONAL

FIRST Components

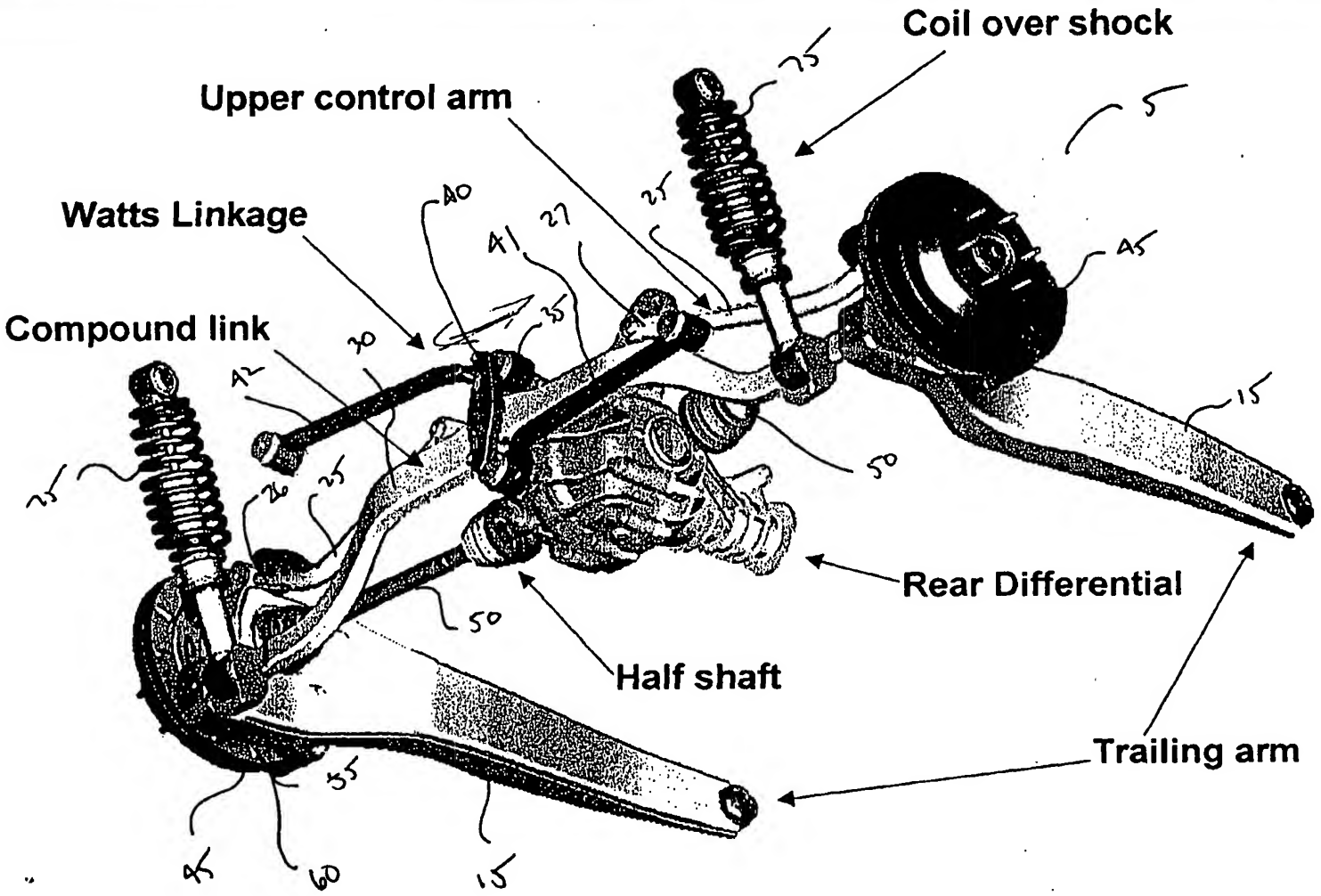

FIGURE 3

Link Attachment

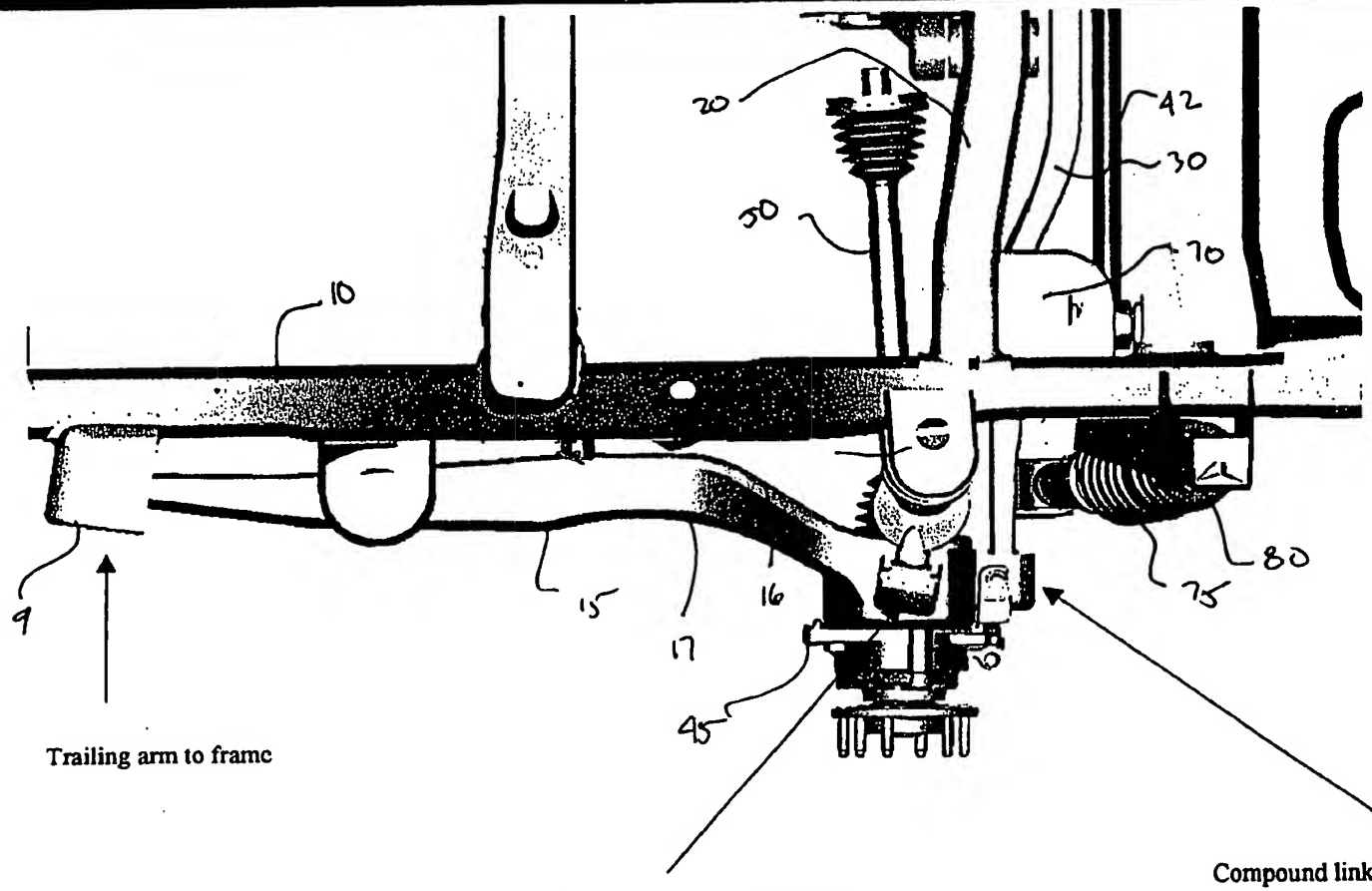

FIGURE 4

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